IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Dobson
Serial No.:	10/717,988
Filed:	November 20, 2003
For:	WINDOW REGULATOR CABLE ASSEMBLIES
Docket No.:	60130-1967

TRANSMITTAL OF CERTIFIED COPY

Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

With regard to the above-referenced patent application, enclosed is a Certified Copy of prior corresponding document GB 0227055.1.

Respectfully submitted,

CARLSON, GASKEY & OLDS

Karin H. Butchko
Registration No. 45,864
400 West Maple, Suite 350
Birmingham, MI 48009
(248) 988-8360

Dated: March 9, 2004

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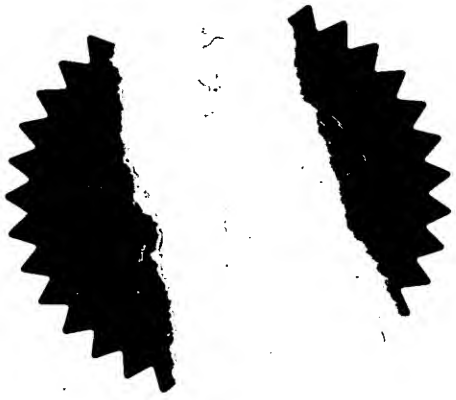

Signed A M Brewer

Dated 28 October 2003

Patents Form 1/77

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20NOV02 E764873-6 D01038
P01/7700 0.00-0227055.1

1/77

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1. Your reference P302136GB/JBJ P46844/000

2. Patent application number
(The Patent Office will fill in this part)
0227055.1

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*
ArvinMeritor Light Vehicle Systems - France
105 Route d'Orleans,
B.P. 48,
Sully-sur-Loire,
45600
France

Patents ADP number *(if you know it)* 07992480001

If the applicant is a corporate body, give the country/state of its incorporation: France

4. Title of the invention: Window Regulator Cable Arrangement

5. Name of your agent *(if you have one)*
"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*
WITHERS & ROGERS
Goldings House
2 Hays Lane
London
SE1 2HW

Patents ADP number *(if you know it)* 1776001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(answer 'Yes' if:*
a) any applicant named in part 3 is not an inventor, or
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Continuation sheets of this form	
Description	7
Claim(s)	2
Abstract	
Drawing (s)	3

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Priority documents	
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Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	One
Request for substantive examination *(Patents Form 10/77)*	
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11. I/We request the grant of a patent on the basis of this application.

Signature JJ & R Date 18/11/02.

12. Name and daytime telephone number of person to contact in the United Kingdom — John B Jones 0121 245 3900

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P302136GB

Window Regulator Cable Arrangement

The present invention relates to window regulator cable arrangements, in particular for use on vehicles such as cars.

The invention is particularly applicable to car doors.

Known cars include car doors having window glass which can be lowered to an open position or raised to a closed position.

The raising or lowering of the window glass is achieved by a window regulator. Geared window regulators are known whereby a relatively small pinion gear is turned and engages with a geared sector having an arm, the arm being attached to the bottom of the window glass.

Cable type window regulators are also known wherein a cable is wound around a cable drum and also a variety of cable pulleys. A cursor is connected to the cable and rotation of the cable drum causes the cursor to lift or lower, thereby lifting or lowering the window glass.

"Single lift" cable arrangements are known (see figure 1 or figure 2). "Dual lift" cable arrangements, of various types, are also known.

Cable arrangements (be it single or dual type) fall into two broad categories, namely bare cable arrangements and bowden cable arrangements.

Figure 1 shows a schematic view of a single lift bare cable window regulator cable arrangement 10. Upper pulley wheel 20 is pivotally mounted via upper pivot 22 onto rigid member 24. Lower pulley wheel 26 and cable drum 30 are also pivotally mounted via respective lower pivot 28 and cable drum pivot 32 onto the rigid member 24. A cable 34 is wound around the wheels, thereby defining cable runs 36, 38 and 40. Cable run 40 includes a cursor 42 which is attached to the bottom of a window glass (not shown).

Rotation of the cable drum 30 in a clockwise direction will cause the cursor 42 to lower, and rotation of the cable drum in anticlockwise direction will cause raising of the cursor 42.

Typically the components shown in figure 1 are provided as a sub assembly and are then mounted into the door via fixing holes 44 where upon the window glass can also be fitted.

When the components of figure 1 are provided as a sub assembly, it is important that the cable remains sufficiently taught to ensure it does not come off any of the wheels. Thus, the pulley wheel pivots must be fixed in the position shown and hence rigid member 24 will typically be made from sheet steel as a pressing with the sheet thickness being of the order of 0.6mm thick. Once the sub assembly has been assembled into the door and secured firmly via fixing holes 44, certain regions of the rigid member, such as that shown cross hatched at A become redundant since the pivots for the wheels are now held in their spaced apart relationship by the rigidity of the door.

Figure 2 shows a single lift bowden cable arrangement 11 wherein components which fulfil the same function as those of cable arrangement 10 are labelled 100 greater. In this case instead of T-shaped rigid member 24, there is provided a rigid member 150 onto which are secured upper pivot 122 and lower pivot 128, thus ensuring that the upper and lower pulley wheels are maintained in the spaced apart relationship shown.

The cable drum wheel 130 is provided on a separate plate 152.

Thus in this case, to ensure that the cable remains on the wheels, bowden cable sheaths 154 are provided on cable runs 136 and 138.

The bowden cable sheaths 154 are flexible and typically comprise a tightly helically wound metal strip forming a tube, the inside of which is lined with a friction reducing material, such as PTFE, and the outside of which is protected by a waterproof material, such as a plastics material. The ends of the bowden cable sheath 154 engage with fittings 156 of the rigid member 150 and plate 152. In particular fittings 156 have to be sufficiently strong to

take a load equivalent to the maximum tensile load in the cable (since fittings 156 react against this load).

It would be appreciated that in view of the flexibility of the bowden cable sheath 154, the ends of a particular bowden cable sheath can move relative to each other. Thus, by bending the bowden cable sheath into a U-shape the ends of the sheath approach each other, and by straightening out the sheath, the ends of the sheath move apart. Thus, the distance between the ends of a sheath "as the crow flies" can be varied. Under certain installations this effect can be used to assist in assembly.

It can be seen that the prior art shown in figure 1 has redundant material, and the prior art shown in figure 2 has an expensive bowden cable sheath and requires relatively strong fittings on the rigid member and plate.

An object of the present invention is to provide an improved window regulator cable arrangement which is cheaper to produce.

Thus, according to the present invention there is provided a window regulator cable arrangement including a cable drum wheel, a 1st top pulley wheel, a 1st bottom pulley wheel, and a cable, the cable drum wheel, top pulley wheel and bottom pulley wheel being in spaced apart relationship with the cable being mounted thereon to provide for cable runs between the wheels, in which at least one wheel is temporarily spaced from another wheel by a semi rigid tube surrounding the associated cable run in order to maintain tension in the cable.

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 shows a schematic prior art "bare cable" single lift window regulator cable arrangement,

Figure 2 shows a schematic prior art "bowden cable" single lift window regulator cable arrangement,

Figure 3 shows schematic a single lift window regulator cable arrangement according to the present invention,

Figure 4 shows a schematic dual lift window regulator cable arrangement according to the present invention,

Figure 5 shows a schematic alternative dual lift window regulator cable arrangement according to the present invention, and

Figure 6 shows a cross section taken along line B-B of figure 3.

With reference to figure 3 there is shown a window regulator cable arrangement 12 according to the present invention, in which components which fulfil substantially the same function as those shown in figure 1 are labelled 200 greater. It can be seen that upper and lower pulley wheels 220 and 226 are mounted on a rigid member 250 which is similar to rigid member 150 of figure 2.

Similarly, cable drum wheel 230 is mounted on a separate plate 252, which is similar to plate 152 of figure 2.

Cable run 236 is surrounded by semi rigid tube 260. In this case the semi rigid tube is made from an extruded plastics material, such as PVC or polyethylene. Tube 260 has a longitudinal slit 262 (see figure 6). Semi rigid tube 261 is identical to tube 260.

The internal diameter of tube 260 is a running fit on cable 234. In this case the internal diameter of the tube 260 is 4mm.

The external diameter of the rube is 6mm.

Ends of tube 260 abut fittings 266.

The function of tubes 260 and 261 is to temporarily space the cable drum wheel 230 from upper and lower wheels 220 and 226 respectively. Thus, it is possible to manufacturer all of the components shown in figure 3 (other than the door 270) as a sub assembly. This sub

assembly can be transported and fitted to the door 270 and the tubes 260 and 261 will ensure that the cable does not come off any of the wheels.

Once the sub assembly has been fitted to the door 270 the tubes 260 and 261 become redundant since the rigid member 250 is kept in its spaced apart relationship relative to plate 252 by virtue of the rigidity of the door 270.

By comparing and contrasting figures 1, 2 and 3 the following will be noted:-

a) all three figures shown embodiments which provide for a sub assembly wherein the cable is under tension and therefore does not become disengaged from the cable drum or the pulley wheels,

b) the redundant material shown cross hatched at A of figure 1 is not present in figure 3, thereby allowing the embodiments shown in figure 3 to be lighter than the embodiments shown in figure 1,

c) the expensive bowden cable sheaths of figure 2 are not present in figure 3. The tubes of figure 3 are cheap to produce,

d) the fittings 156 of figure 2 are required to be sufficiently strong to react against the full cable tension load. The fittings 266 of figure 3 are only required to be strong enough to cope with "transportation" loads which are significantly less than "in service" loads.

As mentioned above tubes 260 and 261 each have a longitudinal slit 262. This allows the tubes 260 and 261 to be removed from their associated cable runs once the sum assembly has been fitted to the door. Additionally, dependent upon the assembly method used, the slit can facilitate assembly of the tubes onto the cable runs during manufacture of the sub assembly, prior to transportation. However, in further embodiments the slit is not required.

Thus, it will be appreciated that semi rigid tubes 260 and 261 should be sufficiently rigid in a longitudinal sense to cope with the above mentioned "transportation" loads. In most practical embodiments, such tubes are also semi rigid in a lateral sense. This results in the ends of the tubes remaining at substantially the same distance from each other, unlike the ends of the prior art bowden cable sheaths.

Figure 4 shows a dual lift cable arrangement 313 with components which fulfil substantially the same function as those of cable arrangement 10 labelled 300 greater.

In this case there are two rigid members 350 and 351 spaced apart laterally. Rigid member 351 includes a second upper pulley wheel 321 and a second lower pulley wheel 327.

In this case there are three cable runs 372, 373 and 374 which include semi rigid tubes 375, 376 and 377.

It can be seen that since cable run 372 crosses cable run 376 at point C, then any contact between these cable runs is prevented by semi rigid tubes 375 and 376.

Thus, once assembled onto the door, it is possible to remove all three semi rigid tubes, in order to reuse them, and in order to lighten the assembly. However, the tubes are sufficiently cheap and sufficiently light weight that they can remain on the assembly if preferred. In particular, where two cable runs cross, it is advantageous to leave at least one semi rigid tub in situe to ensure the cable runs do not contact each other and damage each other as a result of "sawing" action as the regulator is operated in use.

Figure 5 shows a further embodiment of a window regulator cable assembly wherein component switch fulfils substantially the same function as those shown in cable arrangement 313 are labelled 100 greater. In this case the plate on which cable drum wheel 430 is mounted has been incorporated into the rigid member 451. With this type of cable arrangement, the lower pulley wheels 427 and 426 each comprise a pair of wheels which rotate in opposite directions. In this case cable runs 480 and 481 are provided with semi rigid tubes 482 and 483.

In further embodiments certain end fittings can be dispensed with. Thus for example end fittings 266 of plate 252 can be deleted. Under such circumstances the tubes 260, 261 would have to be extended so that they contacted cable drum 230. Once assembled onto the door, the semi rigid tubes could be removed in order to allow cable drum 230 to freely rotate.

In further embodiments, the semi rigid tube can be curved, in particular to accommodate curves associated with the curve of the window glass.

All the embodiments thus far described relate to vertically opening windows. However, the present invention is also applicable to horizontally opening closures. Thus, the terms "top" and "bottom" in the claims should not be regarded as limiting the claims to any particular position in space of one wheel to another.

Claims

1. A window regulator cable arrangement including a cable drum wheel, a 1st top pulley wheel, a 1st bottom pulley wheel, and a cable, the cable drum wheel, top pulley wheel and bottom pulley wheel being in spaced apart relationship with the cable being mounted thereon to provide for cable runs between the wheels, in which at least one wheel is temporarily spaced from another wheel by a semi rigid tube surrounding the associated cable run in order to maintain tension in the cable.

2. A window regulator cable arrangement as defined in claim 1 in which the tube is made from an extruded plastics material, such as PVC or polyethylene.

3. A window regulator cable arrangement as defined in claim 1 or 2 in which the tube has an internal diameter of between 1mm and 5mm, preferably of between 2mm and 4mm.

4. A window regulator cable arrangement as defined in any preceding claim in which the tube has an outside diameter of between 5mm and 7mm.

5. A window regulator cable arrangement as defined in any preceding claim in which the tube is substantially straight.

6. A window regulator cable arrangement as defined in any preceding claim in which the tube includes a longitudinal slit to allow mounting of the tube on the cable run.

7. A window regulator cable arrangement as defined in any preceding claim in which the first top and first bottom pulley wheels are pivotally mounted via a first top pivot and a first bottom pivot respectively, the pivots being mounted on a first rigid member.

8. A window regulator cable arrangement as defined in claim 7 in which the cable run between the cable drum wheel and first top pulley wheel has said semi rigid tube and the cable run between the cable drum wheel and the first bottom pulley wheel has a further semi rigid tube.

9. A window regulator cable arrangement as defined in claim 8 further including a second top pulley wheel pivotally mounted on a second top pivot and a second bottom pulley wheel pivotally mounted on a second bottom pivot, the first and second pivots being mounted on a second rigid member spaced laterally from the first rigid member.

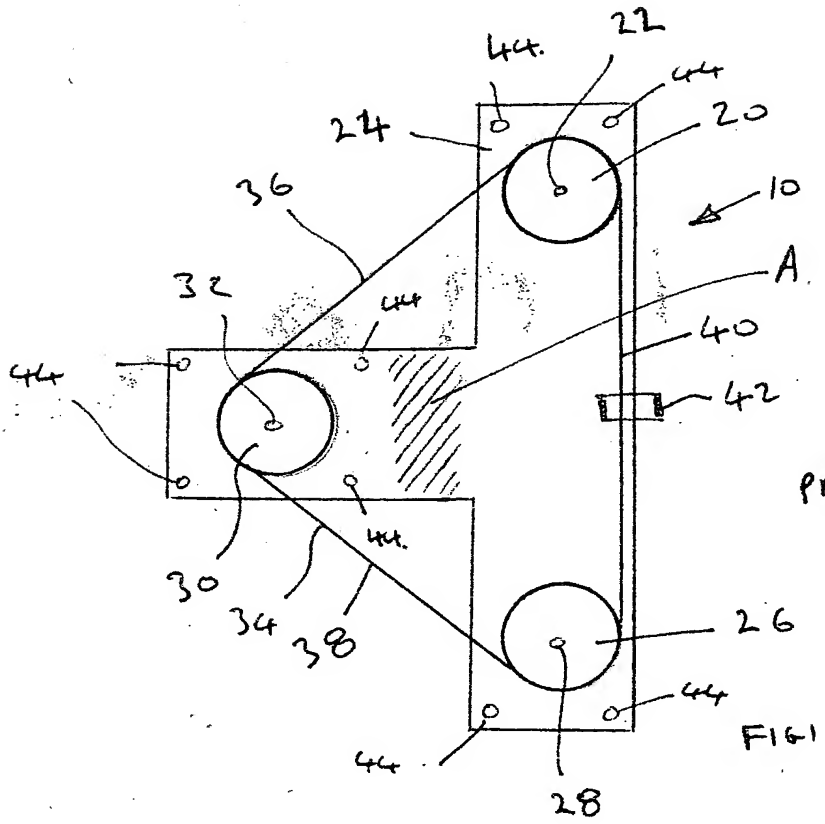
10. A window regulator cable arrangement as defined in claim 9 in which the cable runs other than those between the first top and bottom pulley wheels and between the second top and bottom pulley wheels have said semi rigid tubes.

11. A window regulator cable arrangement as defined in claim 10 in which two cable runs cross and at least one of said two cable runs includes said semi rigid tube to prevent contact between said two cable runs.

12. A method of providing a window regulator cable assembly comprising the steps of providing a window regulator cable arrangement as defined in any preceding claim,
providing a rigid frame,
pivotally mounting the wheels in rigid spaced apart relationship on the rigid frame.

13. A method as defined in claim 12 wherein the rigid frame is a vehicle door.

14. A method as defined in claim 12 or 13 further including the step of removing at least one semi rigid tube following mounting of the wheels in said rigid spaced apart relationship on the rigid frame.



PRIOR ART

FIG 1

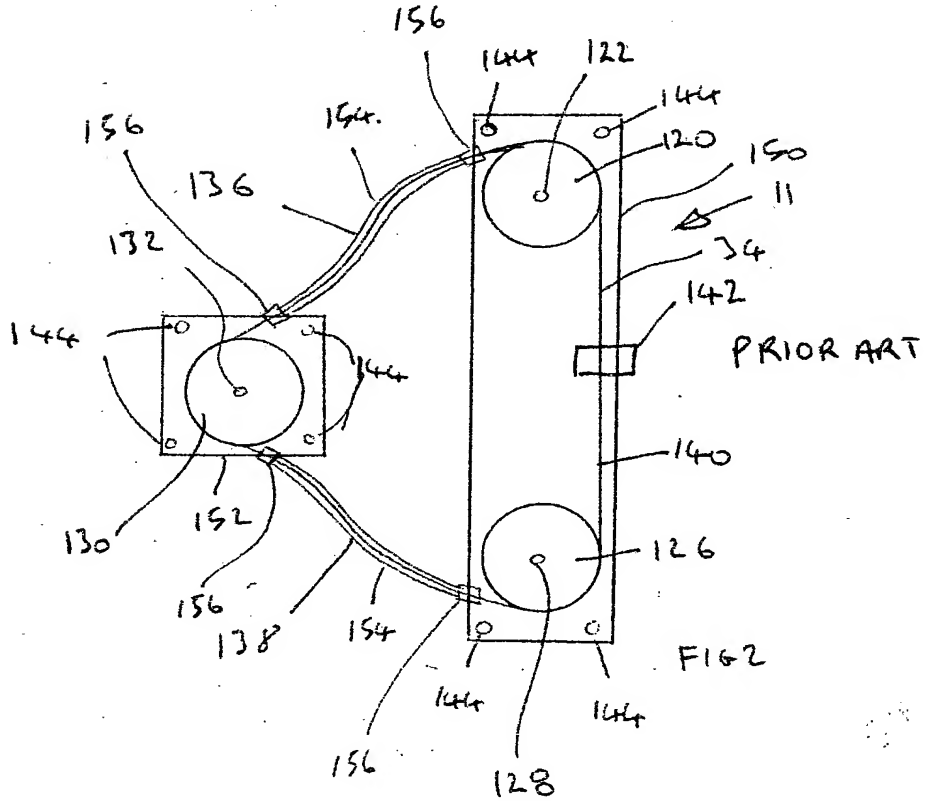


FIG 2

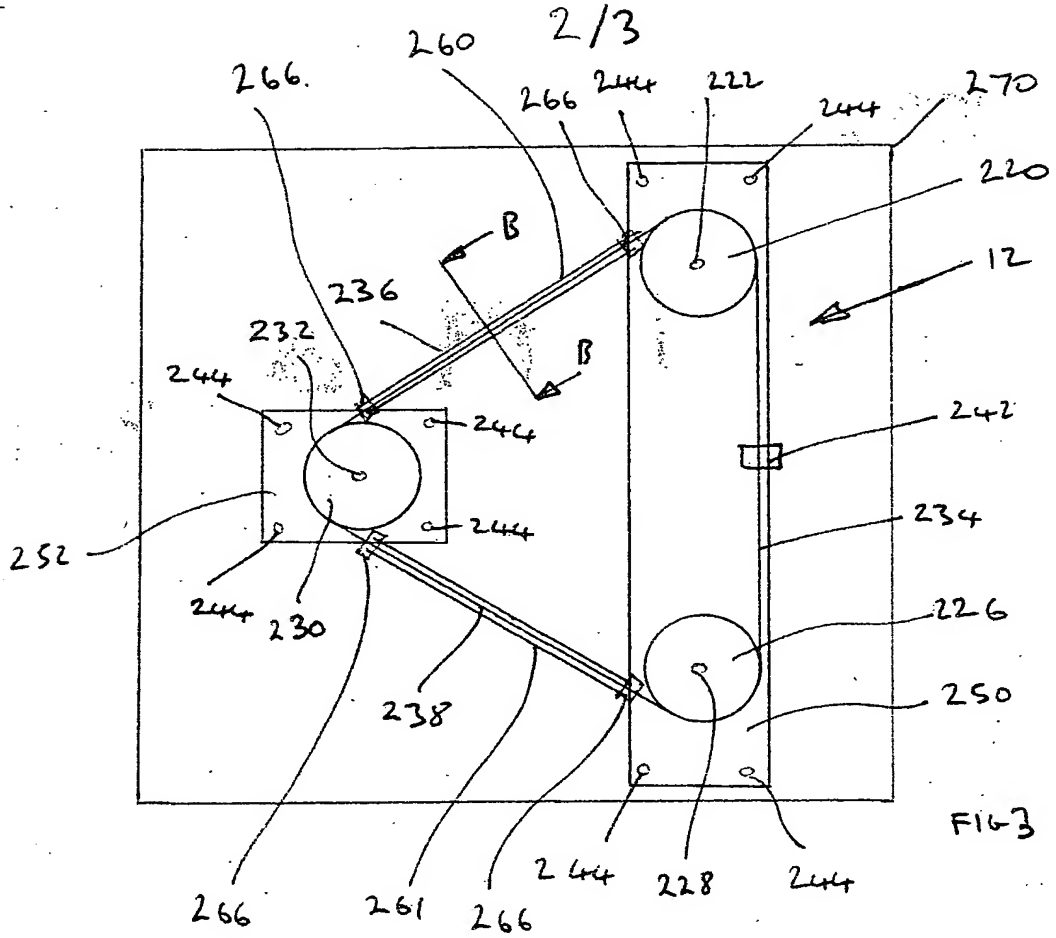

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FIG 3

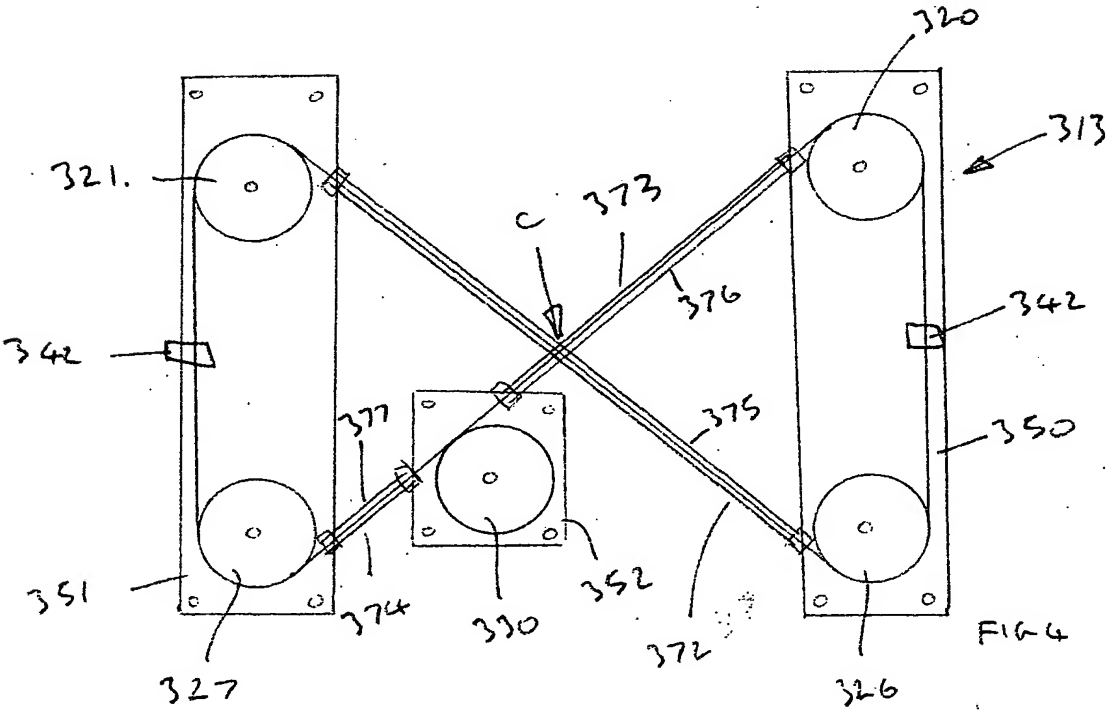
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FIG 4

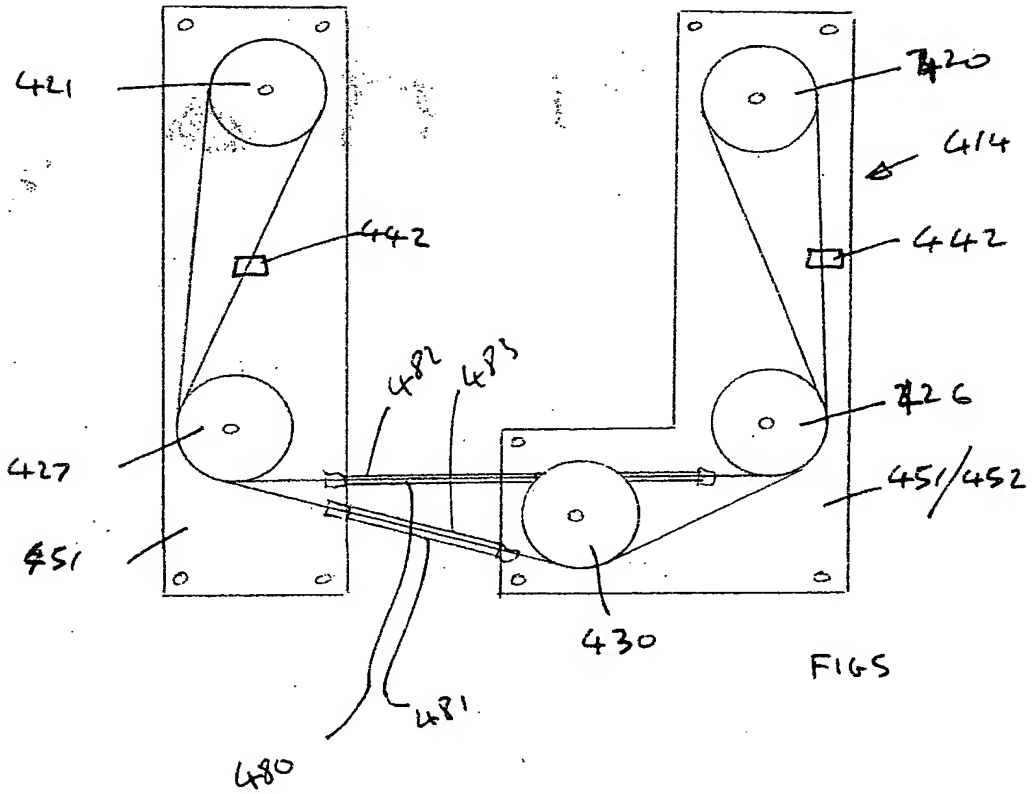
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FIG5

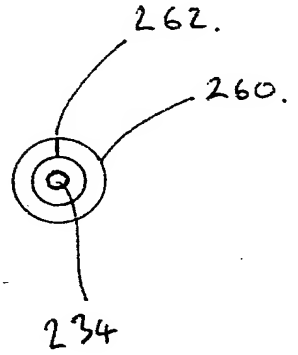
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FIG6